

ZOOPLANKTON OF THE CHUBUT RIVER (ARGENTINA) UPSTREAM AND DOWNSTREAM OF THE AMEGHINO DAM*

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SUMMARY

The object of this study was to investigate the qualitative and quantitative zooplanktonic composition of Chubut River (Argentine Patagonia) in eight sites upstream and downstream from Ameghino Dam. Thirty-nine species (27 Rotifera, 8 Cladocera and 4 Copepoda) were identified. The results seem to support the observations of other authors in different rivers of the World; zooplanktonic densities of Chubut River are extremely low; they increase considerably at the reservoir, before decreasing again downstream; impoundment of water, with subsequent changes in environmental conditions, also results in an increase in species diversity; copepods became dominant in the reservoir, while all the other stations have a typically riverine zooplankton dominated by rotifers. The distribution of species is rather heterogeneous along the river.

Introduction

The Chubut River, with an average flow of 49 m³/sec and a drainage area of about 31.000 km², is one of the main drainages of Argentina Patagonia. It is formed by the confluence of several minor streams in the Andes Range at an elevation of 2360 m., and flows 820 km to discharge into the Atlantic Ocean.

Fifteen kilometers downstream from the junction with its main tributary, the Chico River, the Florentino Ameghino Dam, 70 m. high and a capacity of 190 . 106 km³/h/year, was built between 1954-1963 for hydroelectric power and flood control on the lower Chubut Valley. As a consequence, a large reservoir with a surface of 7.000 hectares, that covers the Chubut River Valley up to Las Plumas and also all the lower Chico Valley, was formed.

This paper is a study of the qualitative and quantitative composition of the zooplankton upstream and downstream of the reservoir. Taxonomical and ecological remarks on some of the recorded plankters are discussed elsewhere (Kuczynski, 1985; 1987).

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Material and methods

Eight sampling stations were chosen (fig. 1), located at the following distances from the mouth of the river in the Atlantic Ocean:

- 1) Los Altares, 328 km.
- 2) Cabeza de Bucy, 285 km.
- 3) Las Plumas, 225 km.
- 4) Florentino Ameghino Dam, 100 m. above the overfall of the reservoir, 145 km.
- 5) Dolavon, 65 km.
- 6) Gaiman, 45 km.
- 7) Trelew, 25 km.
- 8) Rawson, 5 km.

Qualitative and quantitative collections were made with a standard plankton net, 30 μ m mesh, and preserved in 5% formalin. For quantitative samples, 200 l. of water were passed through the net using a 10 l. bucket. Abiotic variables measured were temperature, pH, conductivity, total alkalinity and chloride. Samples were taken in January, 1984. Counts were made with a binocular microscope (40-150x) and a Sedgwick-Rafter cell (1 ml.). Because planktonic densities were low, the whole volume of each sample was analyzed.

Results and discussion

Table 1 shows the fluctuations of physical and chemical variables along the river. Temperature, pH and total alkalinity are rather uniform. The decrease of water temperature at station 4 is possibly due to the effect of the impoundment. The fact that regulated streams below reservoirs have lower summer temperatures than unregulated streams was stressed by Neel (1963) and Ward (1974, 1976 a, 1976 b).

Conductivity and chloride increase downstream. The water is used for urban and industrial supplies at various settlements, and an influence of pollution is possibly implicated.

Quantitative data of zooplankton upstream and downstream of the dam are presented in table 2 and summarized in fig. 2. Of the 39 species recorded along the river, rotifers (16 genera and 27 species) were dominant, with relatively few cladocerans (6 genera and 8 species) and copepods (3 genera and 4 species). Furthermore, rotifers were numerically dominant at all the sites but station 4, which is located immediately downstream of the dam and strongly reflects the biological characteristics of the reservoir. At this station, number of species and densities increase considerably; copepods (especially cyclopoid nauplii) are dominant.

Most studies of the biological effects of impoundments on rivers deal with their influence on algae, zoobenthos, or fishes, and information about zooplankton is comparatively scarce (Cf. Ward & Stanford, 1979). Impoundments have many individual characteristics and differ with geographic conditions; they all, however, change a lotic habitat to a lentic one, with their implied ecological effects of an increase of planktonic biomass and diversity, and a composition of plankton more

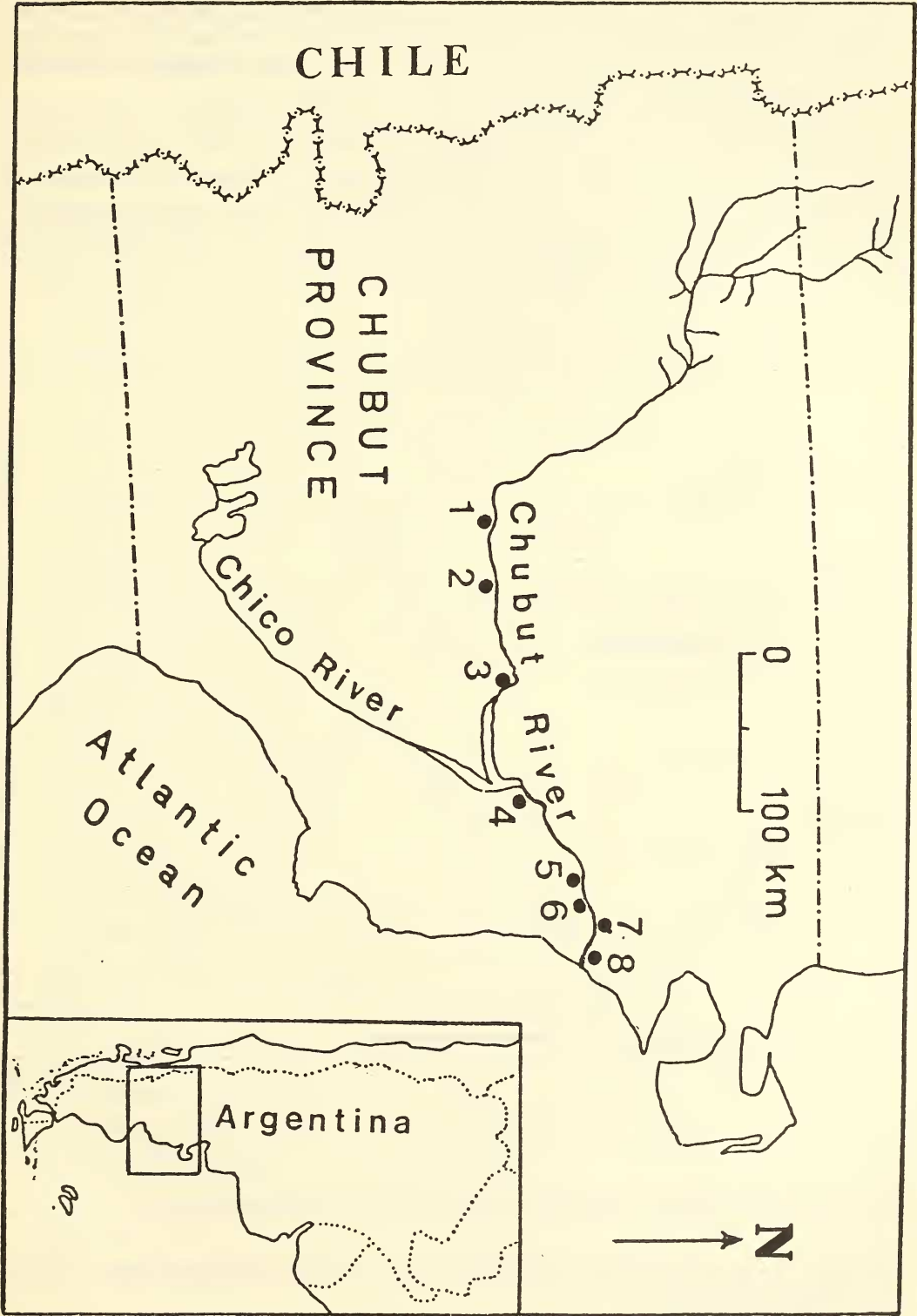


Fig. 1. Map of the study area. Sampling sites are numbered.

similar to those of lakes (Armitage, 1976; Armitage & Capper, 1976; Brook & Rzoska, 1954; Rzoska, 1976; Rzoska et al., 1955; Shiel et al., 1982; Ward, 1975; among others). In rivers, the zooplankton is typically dominated by rotifers, while in lakes, cladocerans and copepods are generally dominant. Furthermore, the potamoplankton shows lower densities than the limnoplankton, and horizontal distribution of plankton is rarely homogeneous along a river.

Densities found in Chubut river are extremely low; high flow and turbidity, inversely related to the plankton production (Armengol et al., 1983; De Paggi, 1976; Hynes, 1970; Paggi & De Paggi, 1974; Rzoska et al., 1955), were present in all the sites of sampling. The fact that a decrease in the flow results in an increase in density of zooplanktonic populations was observed in geographically widespread rivers. viz. the Nile (Rzoska, 1976), the Lower Murray (Shiel et al., 1982), the Volga (Dzyuban, 1979), the Paraná (De Paggi, 1981, 1984) and the Mississippi (Reinhard, 1931). A

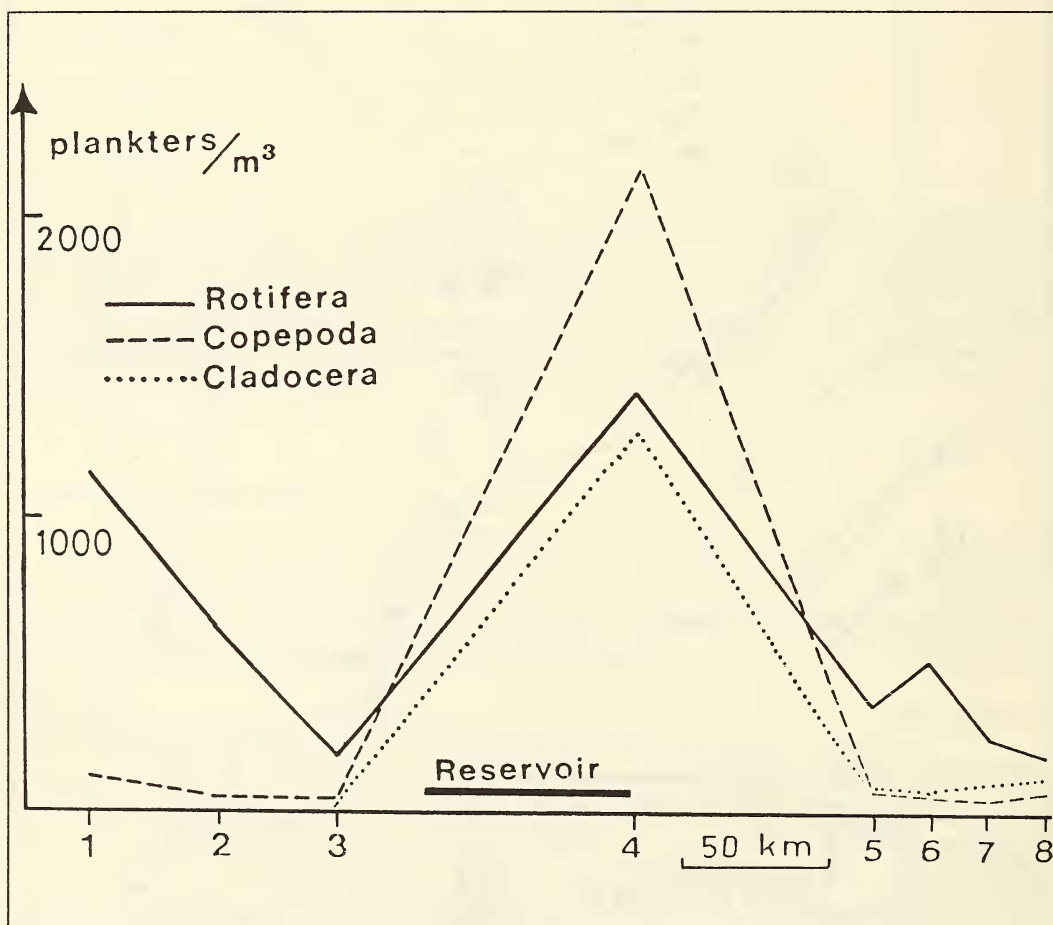


Fig. 2. Longitudinal variation of physical and chemical variables along Chubut River.

correlation between low amounts of conductivity and a decrease in plankton densities was also reported (Welcome, 1979).

In summary, the data presented here seem to support the observations of other authors in different parts of the World: 1) zooplanktonic densities of Chubut river are very low; 2) rotifers are

dominant; 3) the distribution of species is heterogeneous along the river; 4) impoundment of water at Ameghino Dam results in an increase in species diversity; 5) densities increase considerably at the reservoir, before decreasing again downstream; 6) at the reservoir, copepods became the dominant component.

TABLA 1

Sampling station	1	2	3	4	5	6	7	8
Temperature (°C)	18.5	19.0	20.0	16.5	19.5	20.0	19.0	19.5
pH	6.5	6.5	6.5	6.5	7.0	7.0	7.0	7.0
Conductivity (uS.cm ⁻¹)	215	215	220	210	250	260	408	355
Total alkalinity (mg. l ⁻¹)	100	100	100	95	100	100	100	110
Chloride (mg. l ⁻¹)	10	10	10	10	20	23	41	31

TABLA 2

Sampling stations / Species	1	2	3	4	5	6	7	8
ROTIFERA								
(1) <i>Brachionus bidentatus</i> f. inermis (Rousselet 1906)	60	40	30	180	40	30	30	-
(2) <i>B. Calyciflorus</i> Pallas 1766	50	20	-	70	30	40	40	-
(3) <i>B. caudatus</i> f. <i>vulgatus</i> Ahlstrom 1940	-	-	-	30	-	-	-	-
(4) <i>B. havanaensis</i> var. <i>trahea</i> (Murray 1913)	50	40	-	40	30	40	-	-
(5) <i>Cephalodella</i> sp.	60	30	-	-	-	-	20	60
(6) <i>Euchlanis dilatata dilatata</i> Eherenberg 1832	-	-	-	120	60	60	30	-
(7) <i>E. oropha</i> Gosse 1887	50	-	-	-	-	40	-	-
(8) <i>Filinia longiseta</i> var. <i>limpnetica</i> (Zacharias 1893)	40	20	-	350	30	40	-	-
(9) <i>Keratella cochlearis cochlearis</i> (Gosse 1851)	-	-	-	150	30	20	30	-
(10) <i>K. cochlearis</i> f. <i>tecta</i> (Gosse 1851)	-	-	-	30	-	-	-	-
(11) <i>K. kostei</i> Paggi 1981	40	-	-	-	-	-	-	-
(12) <i>K. tropica tropica</i>	-	-	-	30	-	-	-	-
(13) <i>Lecane</i> (M.) <i>bullia styra</i> (Harring & Myers 1926)	-	-	-	-	-	20	-	30
(14) <i>L. (M.) lunaris lunaris</i> (Eherenberg 1832)	-	-	20	50	20	30	50	-
(15) <i>L. (s. str.) luna luna</i> (O. F. Müller 1776)	30	20	-	-	-	-	-	-
(16) <i>L. (s. str.) tenuiseta</i> Harring 1914	30	20	-	-	-	-	-	-

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(17) <i>Lepadella ovalis</i> (O. F. Müller 1786)	30	20	-	-	-	-	-	-
(18) <i>L. patella patella</i> (O. F. Müller 1786)	50	30	30	-	-	-	-	-
(19) <i>Platys quadricornis</i> (Ehrenberg 1832)	-	-	-	-	-	-	20	40
(20) <i>Polyarthra vulgaris</i> Carlin 1943	-	-	-	30	-	-	-	-
(21) <i>Pompholyx complanata</i> Gosse 1851	-	-	-	30	-	-	-	-
(22) <i>Squatinella rostrum rostrum</i> (Schmarda 1846)	50	-	-	-	-	-	-	-
(23) <i>Synchaeta sp.</i> , cf. <i>S. pectinata</i> Ehrenberg 1832	-	-	-	150	-	-	-	-
(24) <i>Testudinella patina</i> (Hermann 1783)	-	-	-	-	20	30	30	50
(25) <i>Trichocerca sp.</i> , cf. <i>T. similis</i> (Wierzejski 1893)	30	30	20	70	20	30	-	-
(26) <i>Trichotria tetractis tetractis</i> (Ehrenberg 1830)	450	250	40	60	40	50	-	-
(27) <i>Wolga spinifera</i> (Western 1894)	120	90	30	-	20	40	-	-
Unidentified Bdelloidea	50	40	-	-	-	30	20	30
Total rotifera	1160	640	190	1420	370	540	270	210

COPEPODA

Cyclopoid nauplii	60	30	30	1680	80	60	50	70
Cyclopoid copepodids	30	20	10	150	-	-	-	-
(28) <i>Acanthocyclops robustus</i> (Sars 1863)	30	-	-	110	-	-	-	-
(29) <i>Mesocyclops longisetus</i> (Thiebaud 1914)	-	-	-	50	-	-	-	-
Calanoid nauplii	-	-	-	120	-	-	-	-
Calanoid copepodids	-	-	-	20	-	-	-	-
(30) <i>Boeckella bergi</i> Richard 1897	-	-	-	20	-	-	-	-
(31) <i>B. gracilipes</i> Daday 1901	-	-	-	20	-	-	-	-
Total copepodas	120	50	40	2170	80	60	50	70

CLADOCERA

(32) <i>Diphanosoma cf. chilense</i> Daday 1902	-	-	10	200	30	20	20	70
(33) <i>D. cf. brachyurum</i> (Lievin 1848)	-	-	-	110	30	-	-	-
(34) <i>Bosmina huaronensis</i> Delachaux 1918	-	-	-	70	10	20	30	-
(35) <i>B. longirostris</i> (O.F. Müller 1785)	-	-	-	50	-	-	-	-

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(36) <i>Ceriodaphnia quadrangula</i> (O. F. Müller 1785)	-	-	-	750	10	20	30	40
(37) <i>Biapertura affinis</i> (Leydig 1860)	-	-	-	30	-	-	-	-
(38) <i>Nacrothrix odontocephala</i> Daday 1902	-	-	-	30	-	-	-	-
(39) <i>Chydorus patagonicus</i> Ekman 1900	-	-	-	60	-	-	-	-
Total cladocerans	-	-	10	1290	80	60	80	110
Total zooplankton	1280	690	240	4880	530	660	300	390

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